US Army Corps of Engineers®
Engineer Research and Development Center

Field Acquisition of Fluid Hydrodynamic Data

Description

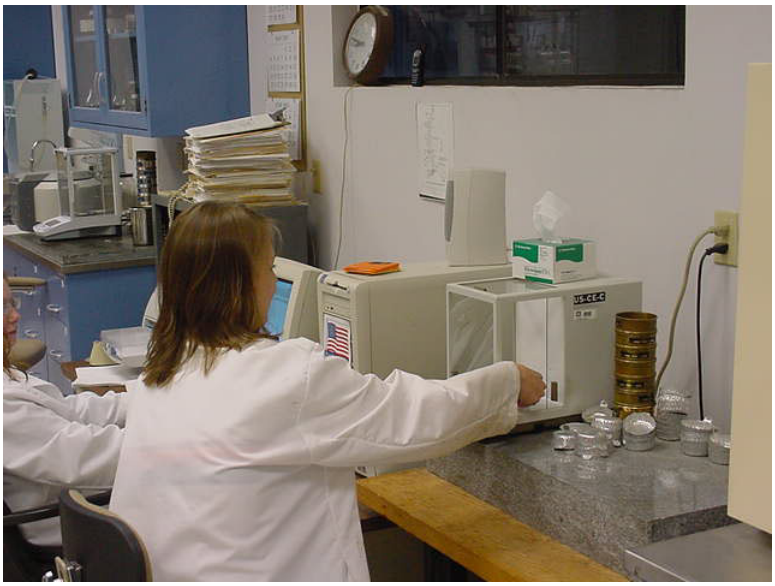
Field acquisition of fluid hydrodynamic data involves the expertise and experience of deploying data collection equipment for obtaining real world and real-time information for studies required primarily by U.S. Army Corps of Engineer Districts. The data collected from these studies are often used in the verification of numerical modeling studies or desktop studies. The U.S. Army Engineer Research and Development Center's (ERDC's) Coastal and Hydraulics Laboratory (CHL) Measurement and Analysis Group is involved in a number of estuarine and riverine studies dealing with such areas as: the transport and deposition of sediments; dynamics of river stages and currents; dynamics of estuary tides, sediments salinity and currents, and development of new and innovative instrumentation.

Capabilities

Engineer researchers and technicians at CHL plan, design, conduct field data collection exercises and analyze collected data for use in verification of multidimensional numerical modeling studies. Numerical modeling studies assess the effects of implementing a proposed alteration to a particular study area or system and the existing data provide a quality control for the model results. For example, before a navigation channel is deepened, researchers would need to know the existing sediment shoaling conditions, tidal velocities, and salinity concentrations to assess how physical changes would affect the system. Questions they would try to resolve might include whether the maintenance of the proposed project would be increased after completion of the project or if it would change the water quality parameters of the study area.

Supporting Technology

State-of-the-art techniques and instrumentation are employed in the monitoring of fluid hydrodynamics of rivers and estuaries. A sufficient inventory of the most modern data collection equipment coupled with trained and talented engineers and technicians provide the resources for quality data collection. In addition, CHL's laboratory facility is available for evaluation of sediment concentrations, grain size distribution, and salinity concentrations of field-collected physical samples.



Benefits

Analysis of collected field data is useful to evaluate effects of the proposed modifications to a system and to determine ways to mitigate any adverse effects. The field data in turn assists the numerical model in identifying likely areas of sediment erosion/deposition or changes in hydrodynamics that may affect water quality. For example, if deepening a channel is expected to increase deposition in an area that would be adversely affected by such an increase in sediment, a sediment trap may be designed at a suitable location to reduce the sediment making its way into that particular location. By analyzing circulation patterns and the characteristics of salinity concentrations in the project area, the need for mitigation measures can be assessed.

Success Stories

- Rapid cross-channel equipment deployment. Expertise of CHL in the design, installation and implementation of field data collection equipment provided the U.S. Environmental Protection Agency (USEPA), Athens, Georgia, with automated cross-channel equipment deployment systems to assist in the collection of various hydrodynamic parameters; velocities, suspended sediment concentrations, and bed- load samples. The automated systems were installed at three locations within the USEPA Broad River study area. These are the only electrically operated systems of their kind to be deployed and operational in the United States.

- Long-term water quality and tide monitoring of the Sabine Neches Waterway. CHL pioneered a long-term study that provided numerical modelers with existing hydrodynamic and water quality data for the proposed channel deepening of the Sabine Neches navigation channel. The data collection effort was begun in March 2001 and completed in February 2002. Sixteen data collection sites were monitored that covered an extensive area of the Sabine River, Neches River, Gulf Intercoastal Waterway, and Sabine Pass Channel. Parameters measured included salinity concentration, velocities, suspended sediment concentrations, and tides.

- Fate of near-bank wave resuspended sediment. An investigation of several sites on the Mississippi River and Illinois River was recently completed for determining the fate of near-bank sediment material resuspended due to waves from passing navigation vessels. CHL implemented the field plan and installed the data collection equipment to collect velocities, water levels, wave heights, drawdown, and suspended sediment concentration data for assessment of the near-bank effects. The data will be utilized in numerical modeling simulations to determine the potential for transport into environmentally sensitive backwater areas along the river systems.

- Quick response for lost navigation equipment at Greenville Bridge, Mississippi River. CHL provided equipment and technical expertise to assist the U.S. Coast Guard and the U.S. Army Engineer District, Vicksburg, in the search and identification of lost equipment and barges resulting from a high-water level barge accident at the Greenville Bridge. Using recently acquired multiyear acoustic depth sounding equipment aboard a CHL field vessel, the lost equipment and barges were located and determined not to be a hazard to navigation. The positions were provided to the District and the Coast Guard for use in potential salvage and recovery operations.

Point of Contact

Timothy L Fagerburg, CEERD-HC-E, e-mail: Timothy.L.Fagerburg@erdc.usace.army.mil, Phone: 601-634-3057.